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Tan

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(54) **UNDERCARRIAGE CLEANING MECHANISM AND METHOD OF PROVIDING THE SAME**

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(58) **Field of Classification Search** 305/100, 305/107, 108, 109, 110; 404/129; 280/855, 280/856; 172/606, 610
See application file for complete search history.

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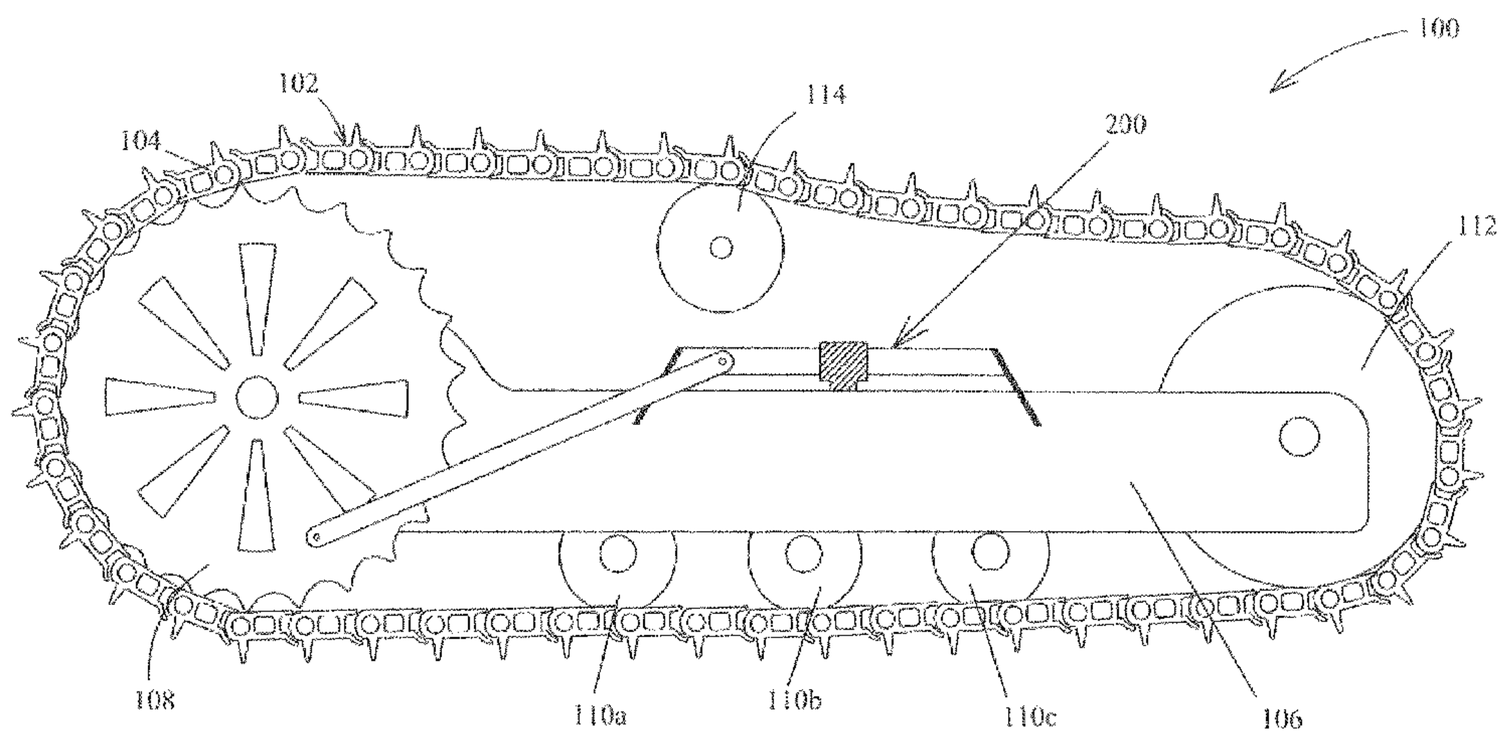
(57) **ABSTRACT**

A track roller frame cleaning mechanism is provided. The track roller frame cleaning mechanism includes a linkage configured to pivotally attach to a rotating track member and means for cleaning a surface of the track roller frame coupled to the linkage.

15 Claims, 3 Drawing Sheets



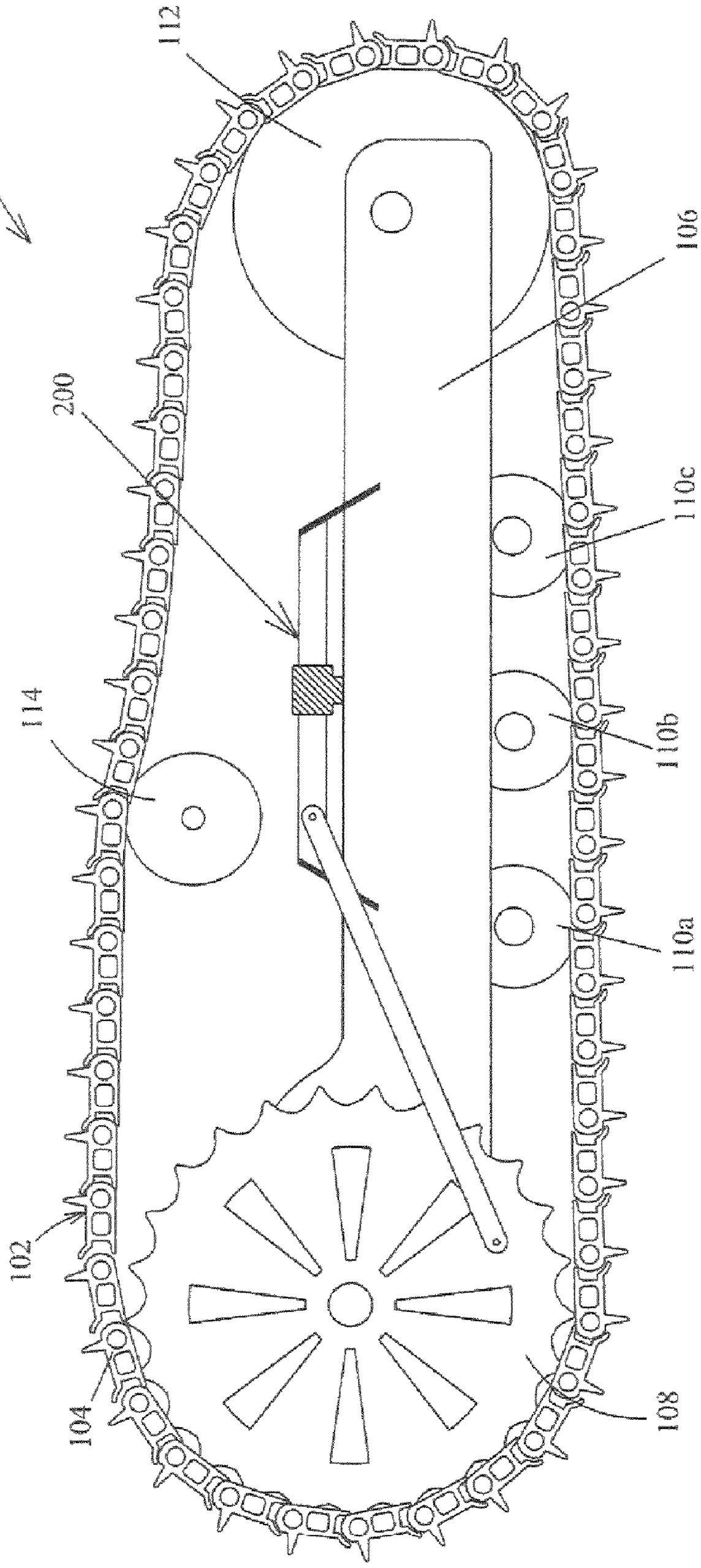


Fig.1

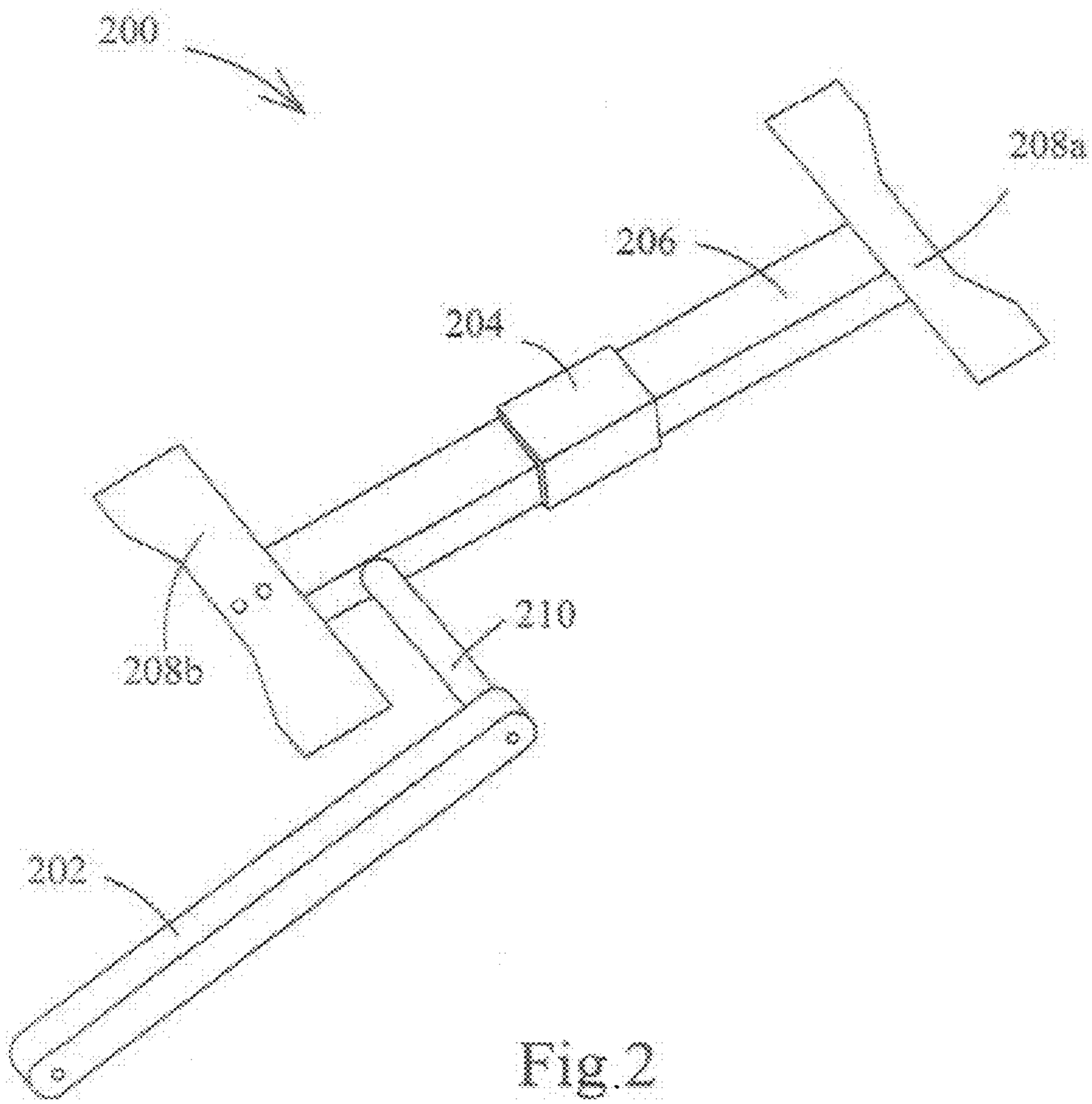


Fig.2

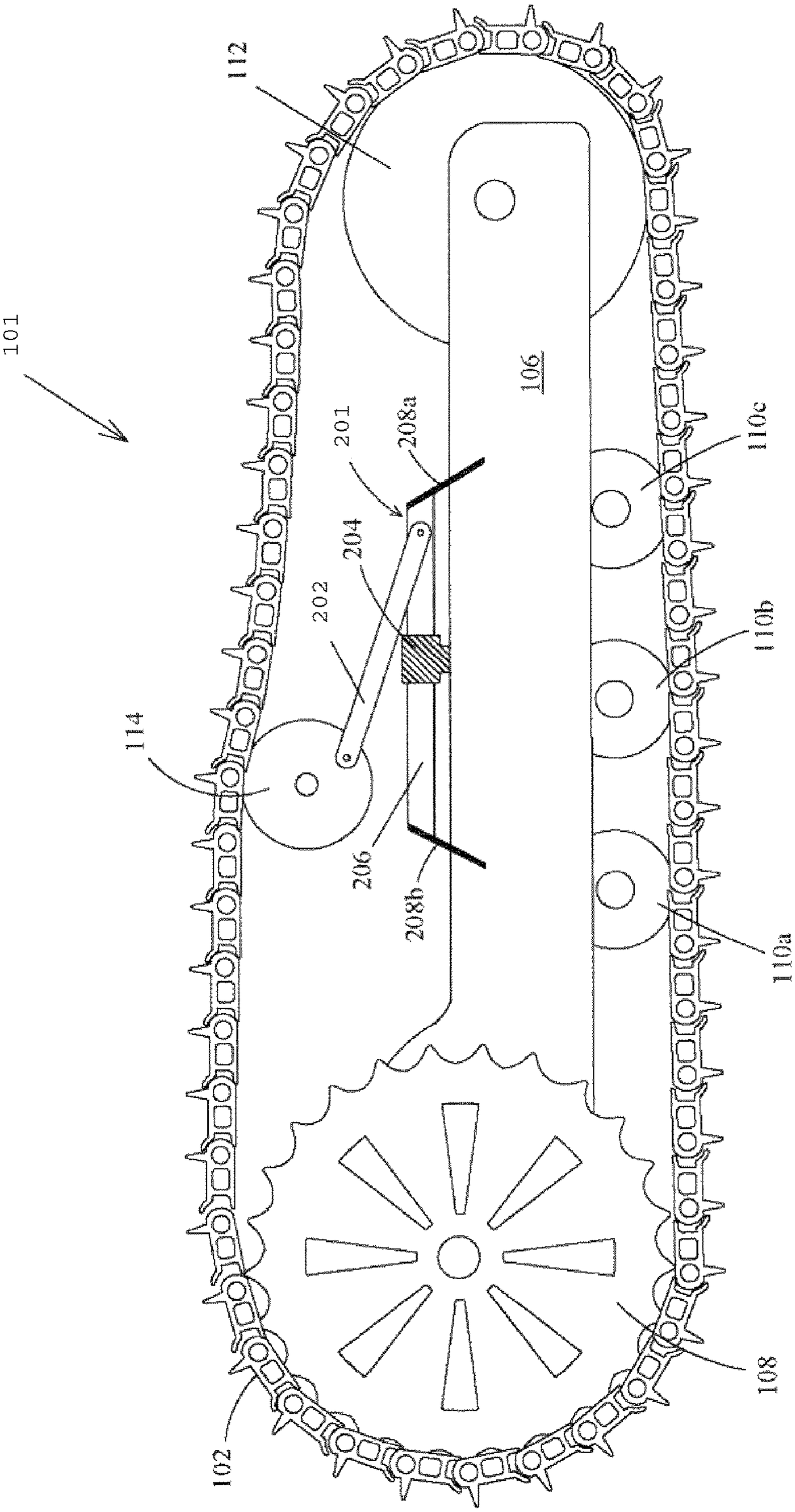

112
101
106
201
208a
204
202
114
206
208b
110c
110b
110a
102
108

Fig. 3

UNDERCARRIAGE CLEANING MECHANISM AND METHOD OF PROVIDING THE SAME

TECHNICAL FIELD

The present disclosure generally relates an undercarriage cleaning mechanism and method of providing the undercarriage cleaning mechanism, and more particularly, to a mechanism for cleaning dirt and debris from a track frame of an undercarriage.

BACKGROUND

Construction, earthmoving and agricultural type machines are often equipped with endless track assemblies for support and propulsion of the machines. The track assembly provides better mobility on uneven ground and typically renders excellent traction while spreading the weight of the machine over a large area. Such machines are commonly operated in a variety of soil conditions. During operation, the movement of the track-type machine typically causes the track assemblies to pick up dirt and debris or any outlying material as it makes contact with the ground, only to have the material deposited on the track frame. As such, the material accumulates on the track frame and subsequently on the other components of the track-type machine. This may result in an increased machine weight, more friction forces between the moving components in the track assemblies and increased machine wear. Wear is generally caused as the accumulated material results in an abrasive action on the components of the machine. This impairs efficiency and produces premature wear of the machine. The machines have to be stopped to remove the accumulated material. Typically, the material needs to be manually removed from the track frame, which results in downtime and increases the maintenance cost of the machine. Also, if the accumulated material is not removed regularly, over a period of time it becomes hardened which increases wear and the difficulty in removing the same.

A number of manufacturers of track-driven machines introduced scraper arrangements to remove dirt and debris from the track assemblies. An example of such a solution is shown in U.S. Pat. No. 5,725,292 issued on Mar. 10, 1998, and assigned to Caterpillar Inc. In this example, a scraper assembly is provided, having a plurality of scraping portions to continuously engage with the contact surfaces of the idler of a track assembly to remove foreign material therefrom. The patent provides for removal of the debris from the track assembly and prevents the debris from remaining on the contact surfaces of the idler during their engagement with the track assembly. However, the disclosure does not provide for removal of the accumulated debris on the track frame while the machine is in operation.

The present disclosure seeks to overcome one or more of the problems as set forth above.

SUMMARY

In one aspect of the present disclosure, a track roller frame cleaning mechanism is provided. The track roller frame cleaning mechanism includes a linkage configured to pivotally attach to a rotating track member and means for cleaning a surface of the track roller frame coupled to the linkage.

In another aspect of the present disclosure, an undercarriage is provided. The undercarriage includes a track frame, a rotating track member and a slider. The rotating track member is rotatably attached to the track frame and the slider is coupled to the rotating track member and slidably disposed adjacent a surface of the track frame.

In a third aspect of the present disclosure, a method of providing an undercarriage is provided. The method includes the step of providing a track frame. The method also includes the step of rotatably attaching a rotating track member to the track frame. The method also includes the step of coupling a slider to the rotating track member and slidably disposing the slider adjacent a surface of the track frame.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagrammatic side view of an undercarriage of a track-type machine according to one embodiment of the present disclosure;

FIG. **2** is an isometric view of a cleaning mechanism according to one embodiment of the present disclosure; and

FIG. **3** is a diagrammatic side view of an undercarriage of a track-type machine according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

According to various exemplary embodiments of the present disclosure, rotating movement of rotating track members of a machine is utilized to provide a reciprocating motion to a cleaning mechanism installed therein for preventing accumulation of dirt and debris on a surface of the machine, while the machine is in operation.

In one embodiment, rotating movement of rotating track members of a track-type machine is utilized to provide a reciprocating motion to a cleaning mechanism installed therein for preventing accumulation of dirt and debris on a surface of a track frame of the machine, while the machine is in operation. The term 'rotating track member' as used herein includes final drive drum, sprocket, rollers, bogie assemblies, carrier rollers, idlers or any other member of an undercarriage of the track-type machine that is rotatable about an axis and is adapted to propel a flexible track assembly or provide support thereof.

Turning now to the drawings and referring first to FIG. **1** that illustrates an exemplary undercarriage **100** of a track-type machine (not shown) according to an exemplary embodiment of the present disclosure. The undercarriage **100** includes such as, but not limited to, a track assembly **102**, a track frame **106**, a final drive drum **108**, such as, for example, a sprocket, a plurality of rollers **110***a*, **110***b*, **110***c*, at least one carrier roller **114** and an idler **112**. The track assembly **102** includes transversely disposed track shoes **104** articulately linked together in side-by-side relationship by hinges or links. According to an exemplary embodiment, the idler **112** is situated on the rear side of the track frame **106** and the carrier roller **114** is located at the top section of the track frame **106**. The rollers **110***a*, **110***b*, **110***c* are positioned below the track frame **106** between the idler **112** and the final drive drum **108**. The track assembly **102** is entrained about and supported by the final drive drum **108**, the idler **112**, the carrier roller **114** and the rollers **110***a*, **110***b*, **110***c*. When rotated by the final drive drum **108**, the track assembly **102** rotates about these components in rolling contact therewith and provides motive traction between the ground and the track-type machine and propels the track-type machine over a terrain. A mechanism **200** according to the present disclosure for cleaning the track frame **106** of the undercarriage **100** is secured to the track frame **106**.

FIG. **2** illustrates the mechanism **200** in detail. The mechanism **200** is shown as a four-bar slider-crank linkage,

although other arrangements may be used. The mechanism **200** includes, but is not limited to, a connecting rod **202**, a guide **204**, a slider **206** and means for cleaning a surface of the track roller frame or cleaning elements **208***a*, **208***b*. The connecting rod **202** is pivotally attached to the slider **206**. In one example, the connecting rod may be hinged to the slider **206** on one end through a spacer **210** and can be pivotally attached to a rotatable member of the undercarriage **100** on the other end. In one embodiment, the connecting rod **202** may be pivotally attached to a final drive drum **108** (as shown in FIG. **1**) of the undercarriage **100**. The connecting rod **202** may be mounted at a location offset from the rotation axis of the final drive drum **108**. The slider **206** has cleaning elements **208***a*, **208***b* such as, but not limited to, a scrubber, a brush, a blade or any other suitable cleaning tool, attached thereto. In one example embodiment, a pair of cleaning elements may be attached at both the ends of the slider **206**. In this embodiment, the slider **206** has a horizontally oriented centerline and the plane of the cleaning elements **208***a*, **208***b* form an angle with a plane perpendicular to the vertical centerline when the mechanism **200** is viewed in a vertically oriented plane. In one embodiment, the angle forms an acute angle. The slider **206** may be held by the guide **204** that in turn is attached to the track frame **106** (as shown in FIG. **1**). The guide **204** steers the movement of the slider **206** along the track frame **106**. In this example, when the track-type machine is running, the connecting rod **202** rotates with the final drive drum **108** of the undercarriage **100**, providing a reciprocating movement to the slider **206** along the track frame **106**. This in turn results in a reciprocating motion of the cleaning elements **208***a*, **208***b* that facilitates cleaning dirt, debris or any outlying material accumulated on the track frame **106**.

FIG. **3** describes an undercarriage **101** having a mechanism **201** for cleaning the undercarriage **101** according to an alternate embodiment of the present disclosure. The undercarriage **101** includes elements such as, but not limited to, an endless track assembly **102**, a track frame **106**, a final drive drum **108**, a plurality of rollers **110***a*, **110***b*, **110***c*, at least one carrier roller **114** and an idler **112**. According to an exemplary embodiment, the idler **112** is situated at the rear part of the track frame **106** and the carrier roller **114** is located at the top section of the track frame **106**. The rollers **110***a*, **110***b*, **110***c* are positioned below the track frame **106** between the idler **112** and the final drive drum **108**. The track assembly **102** is entrained about and supported by the final drive drum **108**, the idler **112**, the carrier roller **114** and the rollers **110***a*, **110***b*, **110***c*. A mechanism **201** for cleaning the track frame **106** of the undercarriage **101** is secured to the track frame **106**. The mechanism **201** includes, but is not limited to, a connecting rod **202**, a guide **204**, a slider **206** and a plurality of cleaning elements **208***a*, **208***b*. According to this embodiment, the connecting rod **202** is pivotally attached to the slider **206** on one end and to a carrier roller **114** on the other end. In one example, the connecting rod may be hinged to the slider **206** through a spacer **210**. In one embodiment, the connecting rod is mounted at a location offset from the rotation axis of the carrier roller **114**. The slider **206** has cleaning elements **208***a*, **208***b* such as, but not limited to, a scrubber, brush or any other suitable cleaning tool, attached thereto. In one example, a pair of cleaning elements **208***a*, **208***b* may be attached at both the ends of the slider **206**. The slider **206** is held by the guide **204** that in turn secures to the track frame **106**. The guide **204** steers the movement of the slider **206** along the track frame **106**. During operation of the track-type machine, the connecting rod **202** rotates with the carrier roller **114** providing a reciprocating movement to the slider **206** along the track frame **106**. The slider **206** in turn reciprocates the cleaning elements **208***a*, **208***b* thereby cleaning dirt, debris or any outlying material accumulated on the track frame **106** while the machine is running and moving.

Thus, the structural design according to the example embodiments of the present disclosure uses a four bar linkage mechanism in a slider-crank arrangement. The four bar linkage mechanism uses rotating movement of the machine's rotating track members to create a back and forth motion of a plurality of cleaning members attached thereto when the machine is in operation. This results in performing a self-cleaning task while the machine is running or moving. In other alternative embodiments, the connecting rod **202** may be configured to be pivotally attached to any other rotating component of the undercarriage **100** such as, but not limited, to the idler **112**, depending on interference with the track frame **106**.

INDUSTRIAL APPLICABILITY

The operation of the present disclosure is best described in relation to its use in earthmoving machines, particularly those machines performing a digging or loading function, such as an excavator, a backhoe loader or machines with endless track assemblies. In one embodiment, the machine is a track-type tractor.

As shown in FIG. **1**, the track assembly **102** is driven by the final drive drum **108** that in turn rotates various other components such as the rollers **110***a*, **110***b*, **110***c*, the carrier roller **114** and the idler **112** along with the movement of the track assembly **102**. The mechanism **200**, as illustrated in FIG. **2**, includes the connecting rod **202**, the guide **204**, the slider **206** and the cleaning elements **208***a*, **208***b*, installed on the track frame **106**. The connecting rod **202** may be hinged to the slider **206** on one end through the spacer **210** and on the other end to a rotating track member such as, but not limited to, the final drive drum **108** (as shown in FIG. **1**) or to the carrier roller **114** (as shown in FIG. **3**). The slider **206** has cleaning elements **208***a*, **208***b* such as, but not limited to, scrubbers, brush or blade, or any other suitable cleaning tool, attached at both the ends. The slider **206** is held by the guide **204**; the guide **204** in turn is attached to the track frame **106**. The guide **204** steers the movement of the slider **206** along the track frame **106**.

During operation as the undercarriage **100**, **101** operates, the track shoes **104** of the track assembly **102** make contact with the ground and collect soil, dirt, debris and other outlying material as they move on the ground. The material collected by the track shoes **104** typically falls on the track frame **106** thereby resulting in accumulation of the material thereon. As the track assembly **102** operates, the final drive drum **108** or the carrier roller **114** drives the connecting rod **202**. The connecting rod **202** in turn drives the slider **206** back and forth along the track frame **106** which in turn provides a reciprocating motion to the means for cleaning a surface of the track roller frame or cleaning elements **208***a*, **208***b*. The reciprocating action of the cleaning elements **208***a*, **208***b* along the track frame continuously remove the material from the track frame **106** thereby preventing accumulation of the material on the track frame **106**.

Thus, the self-cleaning of the track frame **106** performed while the machine is running or moving leads to reduction in manual cleaning of the undercarriage. Further, it results in preventing accumulation of unwanted material in the undercarriage **100**, **101** and clogging of the same over a period of time. Clogging of the material results in hardening of the same over a period of time and adds to the difficulty in removing the material manually, apart from contributing to

the increase in the machine weight and the increase in friction forces between the moving components in the track assembly. The self-cleaning operation can aid in eliminating time-consuming cleaning tasks, reduce high maintenance costs and decrease the downtime associated with manual cleaning. Thus, apart from causing reduction in wear of the machine to a greater degree, the self cleaning operation can also aid in increasing efficiency and non-stop working hours of the machine.

While certain embodiments of the disclosure and methods of practicing the same have been illustrated and described herein, it is to be understood that the disclosure is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

Other aspects, objects and advantages of this disclosure can be obtained from a study of the drawings, the disclosure, and the appended claims.

What is claimed is:

1. A track roller frame cleaning mechanism, comprising:

a linkage with a first end configured to pivotally attach to a rotating track member at a location offset from a rotation axis of the rotating track member;

a slider pivotally attached to a second end of the linkage and configured to reciprocate along a track roller frame in response to a rotating motion of the rotating track member;

at least one cleaning tool attached to the slider and configured to clean material off of the track roller frame responsive to reciprocating motion of the slider.

2. The track roller frame cleaning mechanism of claim **1**, wherein the rotating track member includes at least one of a sprocket, a roller, a carrier roller or an idler.

3. A track roller frame cleaning mechanism, comprising:

a linkage configured to pivotally attach to a rotating track member; and

means for cleaning a surface of the track roller frame coupled to the linkage, wherein the linkage includes:

a connecting rod configured to pivotally attach to the rotating track member; and

a slider pivotally attached to the connecting rod and configured to reciprocate adjacent the surface of the track roller frame in response to a rotating motion of the rotating track member;

wherein the connecting rod has a first end portion and a second end portion, and the first end portion of the connecting rod is configured to pivotally attach to the rotating track member and the second end portion of the connecting rod is pivotally connected to the slider, and further comprising:

at least one cleaning element connected to the slider and configured to slide adjacent the surface of the track roller frame; and

a guide configured to operably connect to the track roller frame, the slider slidably connected to the guide and configured to reciprocally move in response to a rotary motion of the rotating track member.

4. The track roller frame cleaning mechanism of claim **3**, wherein the means for cleaning a surface of the track roller frame includes at least one of a scrubber, a brush or a blade.

5. The track roller frame cleaning mechanism of claim **4**, wherein the slider has a horizontally oriented centerline when the track roller frame cleaning mechanism is viewed in a vertically oriented plane, and the means for cleaning a surface of the track roller frame forms an acute angle with a plane perpendicular to the horizontally oriented centerline.

6. A track roller frame cleaning mechanism, comprising:

a linkage configured to pivotally attach to a rotating track member; and

means for cleaning a surface of the track roller frame coupled to the linkage, wherein the linkage includes:

a connecting rod configured to pivotally attach to the rotating track member; and

a slider pivotally attached to the connecting rod and configured to reciprocate adjacent the surface of the track roller frame in response to a rotating motion of the rotating track member; and

wherein the slider includes a first and a second end, and the means for cleaning a surface of the track roller frame includes a first cleaning element and a second cleaning element, the first cleaning element attached to the slider at the first end and the second cleaning element connected to the slider at the second end.

7. An undercarriage comprising:

a track frame;

a rotating track member rotatably attached to the track frame;

a slider coupled to the rotating track member at a location offset from a rotation axis of the rotating track number and slidably disposed adjacent a surface of the track frame;

a connecting rod pivotally attached to the rotating track member and to the slider;

wherein the slider reciprocates adjacent the surface of the track roller frame in response to a rotating motion of the rotating track member; and

a guide operably connected to the track frame, the slider slidably connected to the guide.

8. The undercarriage of claim **7**, wherein the rotating track member is at least one of a sprocket, a roller, a carrier roller or an idler.

9. An undercarriage comprising:

a track frame;

a rotating track member rotatably attached to the track frame;

a slider coupled to the rotating track member at a location offset from a rotation axis of the rotating track member and slidably disposed adjacent a surface of the track frame;

a connecting rod pivotally attached to the rotating track member and to the slider, and

wherein the slider reciprocates adjacent the surface of the track roller frame in response to a rotating motion of the rotating track member;

wherein the slider has a first and a second end, the undercarriage further comprising:

a first and a second cleaning element; and

the first cleaning element connected to the first end of the slider and the second end of the slider connected to the second cleaning element.

10. The undercarriage of claim **9**, wherein the first and second cleaning elements includes at least one of a scrubber, a brush or a blade.

11. A method of providing an undercarriage, comprising:

providing a track frame;

rotatably attaching a rotating track member to the track frame; and

coupling a slider to the rotating track member at a location offset from a rotation axis of the rotating track member and slidably disposing the slider adjacent a surface of the track frame;

wherein the step of coupling the slider to the rotating track member includes:

pivotally attaching a connecting rod to the rotating track member; and

pivotally attaching the slider to the connecting rod and slidably disposing the slider adjacent the surface of the track frame;

wherein the slider reciprocates adjacent the surface of the track roller frame in response to a rotating motion of the rotating track member;

operably connecting a guide to the track frame; and

slidably connecting the slider to the guide.

12. The method of claim **11**, wherein the rotating track member is at least one of a sprocket, a roller, a carrier roller or an idler.

13. A method of providing an undercarriage, comprising:

providing a track frame;

rotatably attaching a rotating track member to the track frame;

coupling a slider to the rotating track member at a location offset from a rotation axis of the rotating track member and slidably disposing the slider adjacent a surface of the track frame;

wherein the step of coupling the slider to the rotating track member includes:

pivotally attaching a connecting rod to the rotating track member; and

pivotally attaching the slider to the connecting rod and slidably disposing the slider adjacent the surface of the track frame;

wherein the slider reciprocates adjacent the surface of the track roller frame in response to a rotating motion of the rotating track member;

wherein the slider has a first end and a second end, and further comprising:

providing a first cleaning element and a second cleaning element;

connecting the first cleaning element to the first end of the slider; and

connecting the second end of the slider to the second cleaning element.

14. The method of claim **13**, wherein the first cleaning element includes at least one of a scrubber, a brush or a blade.

15. The method of claim **13**, wherein the second cleaning element includes at least one of a scrubber, a brush or a blade.

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